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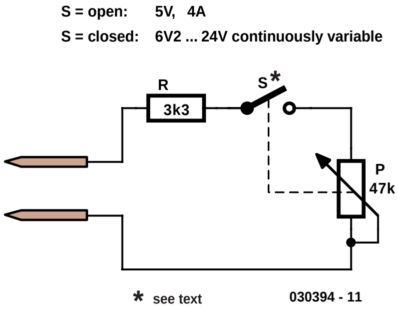

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Global Power Supply

With continuously variable output voltage

Bernd Oehlerking

Small switch-mode power supplies are often available at a low price from jumble sales, electronics surplus outlets and high street electronics shops. We'll show you how these units can be put to good use.

These SMPSUs from surplus lots can handle any power line voltage between 100 V and 240 V, which makes them suitable for use all over the planet. They adapt automatically to the mains voltage measured. Not much larger than a cigarette pack, these SMPSUs are short-circuit and overload proof, offering an output power of up to 50 watts depending on the type on offer. Usually, the output voltage is adjustable over a wide range between 5 V and 24 V in 1-volt increments. The voltage adjustment is carried out using a small rotary switch or — as in our case — with the aid of labelled code plugs included in the package. These intriguing plugs contain no more than an SMD resistor and two contact pins. Even without a look inside the power supply (which is usually contained in a fully moulded case you can't open without causing permanent damage to the supply) it's not difficult to identify this resistor as part of a voltage divider that determines the voltage at the output of the switch-mode controller IC. Simply by replacing the fixed SMD resistors with a suitable potentiometer, we obtain a continuously variable power supply (**Figure 1**). The potentiometer takes a value of 50 kΩ, linear law. The author used a pot with an end switch (**Figure 2**). When the switch is opened, the output voltage is 5 V. When closed and with the pot at maximum resistance, the level is 6.2 V. Turning the pot towards the zero position causes the output voltage to rise to its maximum value of 24 V. If you use a pot without an end switch you can either fit a separate on/off switch for the 5-V setting or simply unplug the lead to the pot. On the subject of plugs, you'll find that a 2-way pinheader will fit the socket on the SMPSU.

The pot is best built into a small ABS case and fitted with a knob and scale. Once you've measured a couple of frequently used output voltages and marked the associated settings on the scale, any voltage may be adjusted with reasonable accuracy.

The maximum current that can be drawn from the power supply is of course dependent on the output voltage, but inversely proportional for all practical purposes. The SMPSU the author picked up from a shop and used for his experiments was labelled '35 watts'. According to the equipment label, it supplies 1.5 A at 24 V which equates to 36 watts. At 5 V, however, we see that the current spec is just 4 A which means 20 watts of output power. Apparently, internal losses become significant in the lower output voltage range (roughly below 12 V). **Figure 3** shows the actual output voltage as a function of load current. The measurement was carried out in the *Elektor Electronics* design laboratory.

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